What is claimed is:

1.   A method, comprising:

sensing a first cardiac event from a cardiac cycle;

5   determining a second cardiac event from the cardiac cycle that has an

approximately constant timing relationship with respect to the first cardiac event;

determining a first time interval between the first cardiac event and the second

cardiac event; and

delivering a pacing pulse for enhancing systolic performance using a delay time

10   interval referenced to the first cardiac event and calculated from the first time interval

between the first cardiac event and the second cardiac event by using a predetermined

mathematical relationship.

2.   The method of claim 1, wherein determining a second cardiac event from the

15   cardiac cycle that has an approximately constant timing relationship with respect to the

first cardiac event includes determining a mechanical event that has an approximately

constant timing relationship with respect to the first cardiac event.

3.   The method of claim 2, wherein:

20   sensing a first cardiac event from a cardiac cycle includes sensing an atrial

electrical event (P); and

determining a mechanical event that has an approximately constant timing

relationship with respect to the first cardiac event includes determining a mechanical

event that has an approximately constant timing relationship with respect to the atrial

25   electrical event (P).

4.   The method of claim 3, wherein delivering a pacing pulse for enhancing systolic performance using a delay time interval referenced to the first cardiac event and determined from the first time interval between the first cardiac event and the second cardiac event includes determining an atrio-ventricular delay (AVD_c) for optimizing

5   contractility.

5.   The method of claim 4, wherein determining an AVD_c for optimizing contractility includes forming a model that maps a PY interval to the AVD_c, wherein the PY interval represents a time interval between the atrial electrical event (P) and a

10   ventricular mechanical event (Y).

6.   The method of claim 5, wherein Y indicates a beginning of ventricular contraction.

15   7.   The method of claim 5, further comprising measuring Y from ventricular pressure.

8.   The method of claim 5, further comprising measuring Y from wall motion.

20   9.   The method of claim 5, further comprising measuring Y using an accelerometer.

10.   The method of claim 5, further comprising measuring Y using a phonogram.

11.   The method of claim 3, wherein delivering a pacing pulse for enhancing systolic

25   performance using a delay time interval determined from the first time interval between the first cardiac event and the second cardiac event includes determining an atrio-ventricular delay (AVD_s) for optimizing stroke volume.

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12. The method of claim 11, wherein determining a AVD_S for optimizing stroke volume includes forming a model that maps a PX interval to the AVD_S, wherein the PX interval represents a time interval between the atrial electrical event (P) and a left atrial systole peak event (X).

13. The method of claim 12, wherein the left atrial systole peak event (X) is measured by measuring LA pressure.

14. The method of claim 12, wherein the left atrial systole peak event (X) is measured by measuring LV pressure.

15. The method of claim 3, wherein delivering a pacing pulse for enhancing systolic performance using a delay time interval referenced to the first cardiac event and determined from the first time interval between the first cardiac event and the second cardiac event includes determining an atrio-ventricular delay (AVD_{CS}) for improved contractility and stroke volume.

16. The method of claim 1, wherein determining a second cardiac event from the cardiac cycle that has an approximately constant timing relationship with respect to the first cardiac event includes determining an electrical event that has an approximately constant timing relationship with respect to the first cardiac event.

17. The method of claim 16, wherein:

sensing a first cardiac event from a cardiac cycle includes sensing an atrial electrical event (P); and

determining an electrical event that has an approximately constant timing relationship with respect to the first cardiac event includes determining a ventricular

electrical event (Z) that has an approximately constant timing relationship with respect to the atrial electrical event (P).

18.   The method of claim 17, wherein delivering a pacing pulse for enhancing
5   systolic performance using a delay time interval referenced to the first cardiac event and determined from the first time interval between the first cardiac event and the second cardiac event includes determining an atrio-ventricular delay (AVD_C) for optimizing contractility.

10   19.   The method of claim 18, wherein determining an AVD_C for optimizing contractility includes forming a model that maps a PQ* interval to the AVD_C, wherein the PQ* interval represents a time interval between the atrial electrical event (P) and a beginning of a QRS complex (Q*).

15   20.   The method of claim 18, wherein determining an AVD_C for optimizing contractility includes forming a model that maps a PR interval to the AVD_C, wherein the PR interval represents a time interval between the atrial electrical event (P) and a peak of ventricular depolarization (R).

20   21.   The method of claim 17, wherein delivering a pacing pulse for enhancing systolic performance using a delay time interval referenced to the first cardiac event and determined from the first time interval between the first cardiac event and the second cardiac event includes determining an atrio-ventricular delay (AVD_S) for optimizing stroke volume.

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22.   The method of claim 1, wherein the predetermined mathematical relationship is determined by:

selecting a cardiac reference event which is used to time a pacing pulse and which repeats every cardiac cycle as the first cardiac event;

5   selecting a cardiac systolic event that has a fixed time relationship with systole of each cardiac cycle as the second cardiac event;

measuring the first time interval between the cardiac reference event and the cardiac systolic event in an unpaced condition;

ascertaining an optimal pacing delay between the reference event and the

10   delivery of a pacing pulse for optimizing a cardiac performance parameter;

collecting first time intervals and optimal pacing delays for a number of patients; and

deriving a mathematical relationship between the first time intervals and the optimal pacing delays.

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23.   The method of claim 22, wherein the cardiac performance parameter includes contractility.

24.   The method of claim 22, wherein the cardiac performance parameter includes

20   stroke volume.

25.   The method of claim 22, wherein selecting a cardiac reference event which is used to time a pacing pulse and which repeats every cardiac cycle includes selecting an electrical cardiac event that repeats every cycle.

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26.   The method of claim 22, wherein selecting a cardiac reference event which is used to time a pacing pulse and which repeats every cardiac cycle includes selecting a

mechanical cardiac event that repeats every cycle.

27.   The method of claim 22, wherein selecting a cardiac systolic event that has a fixed time relationship with systole of each cardiac cycle includes selecting an

5   electrical cardiac event that has a fixed time relationship with systole of each cardiac cycle.

28.   The method of claim 22, wherein selecting a cardiac variable event that has a fixed time relationship with systole of each cardiac cycle includes selecting a

10   mechanical cardiac event that has a fixed time relationship with systole of each cardiac cycle.